

Working Paper No. 41

**Major and Medium Irrigation Projects : An  
Analysis of Cost Escalation and Delay in Completion**

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MAJOR AND MEDIUM IRRIGATION PROJECTS : AN  
ANALYSIS OF COST ESCALATION AND DELAY IN COMPLETION\*

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Recently there has been a growing concern in the government circles and the Parliament regarding the rise in costs and delay in the completion of major and medium irrigation projects<sup>1</sup> in India. According to the press reports the technical evaluation cell of Planning Commission has approved 529 projects (106 major and 423 medium) between 1971 and 1981 with an original outlay of Rs.6820 crores. The cost of all these schemes according to the latest estimates, compiled by the Ministry of Irrigation, has gone up by a staggering sum of Rs.3828 crores and comes to Rs.10648 crores. This indicates an overall increase of 56.13 per cent during the last ten years. The statistics also reveals that 60 schemes, including 4 major ones, were completed in nine states bringing a success ratio of 11.34 per cent only.<sup>2</sup>

One of the main reasons for the inadequate growth of the irrigation sector has been the long time that is taken in the commissioning of major and medium irrigation projects.

There are, perhaps, sufficient reasons for justifying the time that is generally taken. But we are today in a situation, where

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\*Paper accepted for publication in Economic and Political Weekly, May 1982.

I wish to express my thanks to my colleagues Messrs R.K. Verma, S.K. Ghosh, P.S. Garia, K.S. Bisht, P.K. Tripathi and Dinesh Singh in helping me in the computation and tabulation of the data for the period 1971-81 on major and medium irrigation projects.

growth in agricultural sector depends on the successful solution of the irrigation problem, and unless irrigation projects, particularly the major and the medium ones, are completed expeditiously on a time bound basis, there will be no salvation for the economy as a whole. It is reported that "the delay in completion of more than 100 major projects has entailed an additional expenditure of about Rs.5000 crores due to the differences in the original and revised estimates. About 51 lakh ha. of additional potential would have been created if these projects had been completed in time. The rise in cost of these projects, though, is not entirely due to the delay in construction."<sup>3</sup>

The importance attached to the major and medium irrigation schemes can be understood by the fact that the Sixth Five Year Plan (1980-85) for Major and Medium Irrigation Programme envisages an outlay of Rs.10970 crores. Of this, States are expected to provide Rs.10000 crores and the central sector Rs.970 crores.<sup>4</sup> This amount is 47.64 per cent more than the total amount of Rs.7450 crores which has been spent in this sector during the last 30 years.<sup>5</sup> The Minister of State in Ministry of Irrigation stated in the Lok Sabha on 7 September 1981 that 177 major and 414 medium irrigation projects were continuing from the Fifth Plan. Another 172 major and 217 medium projects have been added during the Sixth Plan, details of which were not worked out till then. It was further stated that out of the on going 177 major projects 65 would likely to be completed during the Sixth Plan.<sup>6</sup>

The concern for the mounting costs and the frequent revisions of project estimates and consequent delay in the implementation

of the irrigation projects, is not a new one. In January 1972, the Union Ministry of Irrigation and Power appointed a Committee of Experts to probe into the rise in costs of irrigation and multi-purpose projects. Under the terms of reference, the committee was asked to examine specific aspects of investigation, formulation and execution of projects and recommend improvements of the existing procedure. The Committee's findings and suggestions on various issues have been documented in its report which was submitted to the government in April 1973.<sup>7</sup> Some engineers have also studied the problem of cost escalation and delay in the completion of irrigation and multi-purpose river valley projects, the factors responsible for it and have suggested remedial measures.<sup>8</sup> The working group appointed by the Government of India studied eight on-going projects where the delays had been the longest and identified reasons for delay and proposed measures to obviate these delays in future.<sup>9</sup> Recently when the question of delay and cost escalation was raised in the Lok Sabha, the Union Minister of State in the Ministry of Irrigation stated on November 30, 1981 that the centre had asked the State Governments to speed up completion of on-going Major and Medium Irrigation Projects which have been going on for the last 15-20 years. It was pointed out that the delay in executing the projects was one of the factors contributing to cost escalation and loss of irrigation potential. The state governments were advised to allocate adequate funds and monitor the progress of these projects in the country.<sup>10</sup>

We have also been able to collect latest information regarding 527 irrigation projects (105 major and 422 medium) from the Ministry of Irrigation and have analysed this as well as the data



available from various other secondary sources in terms of various issues and policies which have a bearing and relevance for a sound water resources programme for future. In the Table 1, we have presented the state-wise data regarding major irrigation projects during two periods, for 23 years, during 1946 and 1969 and for 10 years, during 1971-1981. Some of the important trends which appear from the table are very interesting. During 1946-69 period Maharashtra undertook maximum number of 13 projects followed by Bihar and Kerala with 7 projects each in the second position. Andhra Pradesh, Mysore and Madhya Pradesh competed for the third position with 6 projects each. During the 1971-81 period, U.P. stood first with 21 projects followed by Madhya Pradesh 15 and Maharashtra 10 project in the second and third position respectively. During the last 35 years U.P. and Maharashtra stand in the first position with 23 projects each. In case of Maharashtra there is slight variation in the number of projects in the two periods, but in case of Uttar Pradesh the variation is of very extreme type, because in the first period U.P. had only 2 major projects while in the second period it had 21 projects. This means, major irrigation was a low priority in U.P. before the Fourth Five Year Plan. Madhya Pradesh comes in the second position with 21 projects unevenly distributed in the two periods. Bihar obtains third position with an almost even number of projects in the two periods. During the first period 64 major projects were launched at an outlay of Rs.3127 crores, while during the second period 105 major projects were in the various stages of completion at an estimate of Rs.8604.63 crores.

In terms of cost escalation, the average for India was 108 per cent

during the first period, while for the second period it was 66.94 per cent which is about half the average in the first period.

During the first period (1946-69) Kerala had the highest cost escalation, which comes to 238 per cent rise followed by Mysore with 197 per cent rise, Bihar with 194 per cent rise, Haryana with 136 per cent rise, Madhya Pradesh with 128 per cent rise and Andhra Pradesh and Orissa with 124 per cent rise each. During this period Punjab had the lowest cost escalation with 43 per cent rise followed by West Bengal's 61 per cent and Maharashtra's 67 per cent. Punjab was the only state which represented cost rise below 50 per cent. Five states had cost rise above 50 but below 100 per cent. Five states had cost rise above 100 per cent but below 150 per cent. Two states (Mysore and Bihar) had cost rise above 150 per cent but below 200 per cent, and there was only one state (Kerala) having a cost escalation above 200 per cent but below 250 per cent. During this period 14 states launched 64 major irrigation or multipurpose projects.

During the second period (1971-81), Tamil Nadu records the highest cost rise (394.84 per cent) with only one project (improvements to Periyar system) cleared by the Planning Commission in 1976. The second highest cost escalation is recorded in Andhra Pradesh with 372.86 per cent rise, followed by Haryana with 181.62 per cent rise, Gujarat with 146.73 per cent rise and Rajasthan with 145.01 per cent rise. During this period Orissa records the lowest cost escalation (4.91 per cent), it is mainly because the latest cost in case of Upper Indravati Dam and Irrigation Project was reduced by almost 50 per cent, from Rs.208.14 crores to Rs.104.84 crores.

The second lowest cost rise is recorded by Manipur with 14.28 per cent, followed by Bihar with 24.56 per cent, Assam with 26.16 per cent and Punjab with 28.66 per cent rise. As against the first period, when only one state had cost escalation below 50 per cent, there are 7 states in the second period in this category. There are four states with cost escalation above 50 but below 100 per cent against five states in the first period. Three states show cost rise above 100 but below 150 per cent against 5 states in the first period. There is only one state (Haryana) in the category of 150 to 200 per cent rise against two states in the first period. Two states have recorded cost escalation above 350 per cent while there was no state in this category in the first period. During the second period, 17 states have launched 105 major irrigation projects in 10 years, against 64 projects in the first period which represented a span of 23 years.

In Table 2 we have examined the major and medium irrigation projects, plan-wise, in an all-India basis, in terms of latest estimated cost, latest expenditure, ultimate potential and latest potential created during 1971-81. During this period the estimated cost for 105 major projects was Rs.8604.63 crores to create an ultimate potential of 12350.57 thousand hectares, while in case of medium irrigation projects, the estimated cost was only Rs.1614.83 crores, which is 18.77 per cent of the sum estimated for major projects. However, the ultimate potential was almost same as that for major projects. Fifth Five Year Plan period appears to be the most important period for major as well as medium irrigation projects in terms of latest estimate, expenditure incurred upto March 1980 and the ultimate potential. However in terms of the potential created upto June 1980, Fifth Five Year Plan period is

the most important period for the major projects because 84.68 per cent potential was created by June 1980 from the projects taken during this period. On the contrary the major projects taken during the Sixth Plan period (1978-81) created only 2.36 per cent potential. However, in case of medium irrigation, the projects taken during Fourth Plan period (1971-74) created 61 per cent potential by June 1980 from the projects taken during this period. Therefore, the Fifth Plan period (1974-78) was the most important period for both, major and medium irrigation projects, if we take an account of the projects taken during the last ten years. It may be on account of the fact that during the last ten years, Fourth and Sixth Plans were partially covered.

In Table 3 we have examined cost escalation in major and medium projects in terms of States and Five Year Plans during 1971-81. As regard the percentages of cost escalation in major projects during this period, we have examined this aspect while discussing Table 1. However, if we compare the cost escalation during the ten years period between the major and medium projects, we find that the medium projects show a lesser cost escalation compared to the major projects. The percentage of cost escalation in case of medium projects is 48.94 compared to 66.94 for the major projects. An important feature which emerges from the comparative examination is that the projects, both major and medium, initiated during the Fifth Five Year Plan period show lowest percentage of cost escalation, which is 47.18 for the major and 58.23 for the medium projects. And also, maximum number of major and medium projects, numbering 50 for the major and 216 for the medium, were undertaken during this period.



Taking the overall figures of the medium projects state-wise, it is revealed that Madhya Pradesh undertook the maximum number of 73 projects during the last ten years followed by Maharashtra with 69 projects, Gujarat with 48 projects, Bihar with 44 projects and U.P. with 32 projects. Haryana is the only state in India which did not initiate any medium irrigation project during the last ten years. Kerala took only 1 project, Himachal Pradesh and Punjab 2 each and Tripura 3. In case of major projects, Tripura and Himachal Pradesh did not take any major project and Jammu and Kashmir, Manipur and Tamil Nadu took 1 each. Assam, Haryana, Karnataka and Rajasthan initiated 2 each. West Bengal undertook 3 major projects. In terms of cost escalation Orissa comes first with 106.82 per cent rise, followed by Rajasthan with 76.44 per cent rise, Gujarat with 71.08 per cent rise, Punjab with 69.93 per cent rise and West Bengal with 64.90 per cent rise. In terms of low cost escalation Karnataka comes first with only 11.11 per cent rise, followed by Madhya Pradesh with 23.50 per cent rise, Assam with 27.17 per cent rise, Tripura with 28.02 per cent rise and closely followed by U.P. with 28.60 per cent rise. Comparing cost escalation in major and medium projects in various states, we find that there are 7 states in major and 10 states in medium projects showing an escalation below 50 per cent. Below 100 per cent escalation, there are 4 states in case of major and 7 states in case of medium projects. Above 100 per cent escalation, there are 6 states in case of major and only one state (Orissa) in case of medium. In all, 17 states undertook major projects and 18 states medium projects during 1971-81. The overall escalation in all projects (422 medium + 105 major) comes to 63.81 per cent for the last ten years.



Taking the major and medium projects together during 1971-81, state-wise, we find, Madhya Pradesh initiating the maximum number of 88 major and medium projects during the last years, followed by Maharashtra with 79 projects, Gujarat with 56 projects and Bihar and U.P. with 53 projects each. Himachal Pradesh undertook only 2 and Tripura only 3 medium projects, while Haryana undertook no medium projects and 2 major projects. In terms of cost escalation in major and medium projects altogether, the average for India during the last ten years was 48.94 per cent in case of medium and 66.94 per cent for the major. The overall figure was 69.69 per cent for the major and medium taken together and consisting of 527 irrigation projects.

In a paper appearing in November 1976, in the Journal of the Institution of Engineers, the data regarding the estimated cost and the completion cost for 30 irrigation projects and estimated period of completion and actual years in completion for 8 irrigation projects have been provided. The computation of the data show that the estimated cost for the 30 projects was Rs.913.49 crores while on completion it reached to Rs.1966.93 crores, which reveals an overall escalation of 115.32 per cent. The estimated period of completion for 8 projects for which data have been provided varied from 5 years to 17 years. The average estimated time for completion came to 6.25 years, while the actual average time taken in completion came to 10.63 years. Thus, the average time increase for 8 projects was by 4.38 years.<sup>11</sup>

In the foregoing pages we discussed the cost escalation and delay in the completion of major and medium projects. It would be in the fitness of things to examine the various factors responsible for this sorry state of affairs and the remedial measures to be adopted to reduce the margin of cost escalation and delay in the completion of these projects. There are several documents which have dealt with this problem, therefore, we now propose to make a study of these documents. The Report of the Expert Committee (1973), referred earlier, has examined this question in a very detailed and systematic way, therefore, the starting point of our examination would be the findings of the Committee. The Committee examined the cost escalation and the delay in completion of the major irrigation and multi-purpose projects under various heads like, rise in prices, inadequate investigation, inadequate provision, change in scope and design and additional requirements, land acquisition, rehabilitation measures, paucity of funds, poor performance of equipment and procurement problem and management of water resources projects. The methodology adopted by the Committee for its enquiries consisted of, on the one hand sending a questionnaire on the formulation, planning and execution of projects to selected project authorities under their control. On the other hand, detailed analysis of six projects selected for the purpose was done for identifying the quantifying the reasons for increase.<sup>12</sup>

The Committee examined the question of rise in prices in considerable detail and concluded that the increase in the cost of the projects due to the increase in prices was to the range from 35% to 120% of the original estimate. It was further found

out that with regard to earthwork by machinery, earthwork by manual labour, reinforced cement concrete and stone machinery which formed bulk of the works in the various projects, the percentage of average yearly annual escalation was, 12.5, 12.3, 8.8 and 10.1 respectively. Thus, due to inflation, costs of major works had gone up during the last decade at an average annual rate ranging from about 9 per cent to 12 per cent. The Committee concluded that a factor of 7 per cent per year would be a reasonable one for adjustment of estimated costs. The Committee, therefore, recommended that an Adjustment Factor of 7 per cent per year should be adopted for working out 'supplementary provision' for adjusting the cost estimates of planned projects and that one adjustment factor should be reviewed from time to time taking into consideration all aspects of the economy in the country.<sup>13</sup> The Working Group on Irrigation (1980) also held the view that large escalation in costs of projects were found to occur due to large scale rise in cost of labour, material equipment spares, land, etc. The Group felt that escalation in costs not only pushed up the cost of the project but also resulted in postponement of the completion of the project due to inability of states to provide for additional funds for the project commensurate with the rise in costs. The Group, therefore, found it necessary that the States up-date the cost of the projects every year, for which they should create state/project level cost control cells. The question of creation of cost control cells was taken up with the States in the past at various forums, including the conferences of the State Ministers of Irrigation. As a result, the State Level Cell has been set up in Karnataka and project level cells have been formed in the States of Kerala,

Haryana, Karnataka, West Bengal and Madhya Pradesh.<sup>14</sup> To encourage setting of these cells, the Sixth Plan proposes that the States may be insisted in this regard by financing the costs of these cells on matching contribution basis.<sup>15</sup>

The lack of adequate investigations and surveys before the preparation of the project estimates submitted for approval of Planning Commission is an important factor that has caused significant deviation from the original estimated costs of irrigation projects. In Jayakwadi Project, Maharashtra, out of a total increase of nearly Rs.38 crores in the revised estimate about Rs.9 crores representing nearly 24% of increase could be broadly identified as due to inadequate investigations concerning the reservoir and lack of survey for distributories and minors. In Ukai Dam Project of Gujarat, nearly Rs.4.5 crores representing over 8 per cent of the total increase of Rs.54 crores could be attributed to inadequate investigation. In Kangsabati Project of West Bengal, work started immediately with the selection of a site for the construction of the dam in 1956. Investigations went hand in hand with construction. As a result, out of about Rs.21 crores increase, inadequate investigations accounted for nearly Rs.6.7 crores i.e. about 33%. All these distortions and difficulties suggest that the investigations have to be done more thoroughly for preparing a project report and its estimate for approval by the Planning Commission. The Expert Committee's recommendation in this regard was that each State should have a broad-based organisation involving all disciplines (engineering, geology, hydrology, revenue, agriculture, etc.) so that the work is done by persons experienced and expert in each of the specialised fields. It further recommended the



CW & PC (now Central Water Commission) should associate itself closely with the investigation organization set up by the States and give them necessary guidance and assistance in their work.<sup>16</sup>

The Working Group on Irrigation also came to the same conclusion that lack of thorough investigations prior to taking up of the projects is one of the main factors contributing to delays in implementation of projects and consequent rise in costs. To overcome this lacuna, the Group proposed to associate CWC with the investigations of major irrigation project costing more than Rs.30 crores. Like the Expert Committee, the Group also recommended the creation of a state level specialized organisation for this purpose. To persuade the States to do so, it was proposed that the expenditure on investigation of project be financed accommodating contribution basic by the Centre.<sup>17</sup>

In a Seminar in 1977, the question of inadequate investigation and survey was discussed in considerable detail. Y.K. Murthy, the then Chairman CWC in the inaugural session of the Seminar pointed out, that the "standards of preparation of project report are getting diluted . . . in many cases technical studies have not been carried out for selecting the most appropriate dam site after considering several alternatives. Similarly there is scope for improvement in quality and quantity surveys of construction materials and in lay-out studies of the dam, based on the availability of local materials. In many cases, contour surveys of the command area are not carried out. The extent of command area are not assessed on a realistic basis. The norms for design of distribution system are not laid down in the project



report. Surface and sub-surface drainage requirement of the project are not studied and generally no provision thereof is made in the estimates. Cropping patterns are not realistic. Benefit-cost ratio is not worked out on a realistic basis. Specific problems, if any, for the project which are likely to be met during construction are not discussed."<sup>18</sup> He further said, "Experience has shown time and again that incomplete and poorly investigated projects present lot of difficulties during implementation and the cost effectivity of the project ultimately suffers bringing down the benefits drastically."<sup>19</sup> The following two recommendations were approved at the concluding session of the seminar.<sup>20</sup>

1. "Reports for all major projects having a utilization of greater than 1000 million cum or irrigating an area of more than 50,000 hectares shall be presented to CWC in two stages viz., (i) feasibility stage; and (ii) the detailed project report stage."
2. "For all other major and medium projects of the State Government there shall be a Technical Committee of the State which will review the preliminary investigation report and accord the necessary approval for preparation of the detailed project report."

It has generally been found that quite a big chunk of the total increase in the cost of a project is due to the fact that the original provisions made in the estimate at the time of approval of the scheme were inadequate. In case of six projects, namely, Ukai, Ramganga Beas-Sutlej Link, Jayakwadi, Kallada and Kangsabati, the increase on account of inadequate provisions ranged from 8 to 22 per cent. "The inadequacies in the estimates result from lack of experience, failure in visualising the construction methods and procedure in advance, making provisions for construction methods

and procedure in advance, making provisions for major lumpsum items without any attempt to work out the cost even on a rough basis, improper estimation of requirement for establishment, buildings, facilities, etc." In some cases inadequacies are on account of the fact that sufficient time is not devoted in framing of the estimates. Sometimes, on account of pressure from public or politicians, over-optimistic estimates are prepared leading to delay in completion of projects as the enhanced requirements of funds cannot be easily met. Inadequate provisions in the original estimate of Ramganga Project, U.P., accounted for over Rs.16 crores and the Dam and appurtenant works in unit I alone costed over Rs.13 crores.<sup>21</sup>

It is not uncommon that the scope of the projects have been increased during the course of construction. Such changes in scope may be in the form of increase in area to be irrigated, increase in power generation capacity or increase in flood control benefits or any other thing. The estimated cost of Mahanadi Delta Project in Orissa increased from Rs.14.92 crores to Rs.68.38 crores showing an increase of about Rs.53.46 crores, of it about 16 per cent was on account of change in scope of the project. In case of Ramganga project in U.P. the increase was over Rs.11 crores, which represented about 12% of the total increase of about Rs.91 crores.<sup>22</sup> In case of Kosi, initially the project was primarily intended for flood protection and irrigation. However, during the Third Five Year Plan, the new schemes incorporated in the project were : (i) the hydel power station on the main canal to generate 20,000 KW; (ii) Rajpur branch canal taking off from the eastern main canal, intended to irrigate an area of 397 thousand acres in

Saharsa; (iii) the western Kosi canal system with the western main canal taking off from the barrage, intended to irrigate an area of 325.10 thousand hectares in the district of Darbhanga and in Nepal; (iv) extension of the two eastern and western flood embankments; and (v) construction of water courses upto one cusec capacity at the project cost. As a result of the increase in the scope of the project and original estimate of Rs.37.10 crores, in 1954 has been revised several times. In January 1972 a revised estimate of Rs.165.93 crores, representing an escalation of 347.25 per cent was sent to erstwhile CWPC, which was not approved till June 1977. The actual expenditure incurred on the project upto March 1976 was Rs.143.19 crores.<sup>23</sup> The Expert Committee's recommendation in this regard was that, the changes in scope should be avoided and the projects should be more comprehensively planned at the early stage by placing the charge of investigation and project formulation on experienced and competent technical personnel.<sup>24</sup> According to the Working Group on Irrigation, in many cases, changes in the scope of the projects, during implementation stage could have been avoided had the project been investigated and planned thoroughly in the first instance. The additional works resulted in steep escalation in project costs as well as extended period of construction.<sup>25</sup>

The nature of river valley projects is so complex that all the items and requirements cannot be visualised at the stage of preparation of the feasibility report (project report submitted for approval of the Planning Commission), however adequate the investigations may have been. "Feasibility reports are based on broad designs for major features. Some changes take place at

the detailed design stage which follows vigorous and detailed design studies. These may come due to adoption of changed design criteria, modification of layouts, going for better specification of works and so on. One has, therefore, to reckon always with some increase in cost on account of these changes." The Expert Committee felt that for covering the increase which would invariably occur in such projects, an additional provision should be made in the estimate under a head which could be called "margin of error". The Committee, however, found that the increases and reductions in estimates on account of change in designs were not very consistent and as such did not help in arriving at the "margin of error" which the Committee could have recommended. For specifying any limits for margin of errors the works were divided in three groups : (1) head works, (2) tunnels and other underground works, and (3) distribution. The "margin of error" fixed by the Committee was 10 to 15% for the first group and 30 to 40% for the second group. The third group was sub-divided into several categories, where margin of error varied from 20 to 40 per cent.<sup>26</sup> Datta and Aggarwal, in a recent paper in the Journal of Institution of Engineers, have rightly advocated a step by step scrutiny and checking of different components of various works with respect to their completion as per specifications and design requirement as mandatory before commissioning a multipurpose river valley project. They caution against use of any kind of short-cut for this essential work and point out that a careful attention to the shortcoming in design or defect in construction detected in the initial stage can save costly repairs and huge damage at a later date.<sup>27</sup>



Non-availability of scarce materials like cement, steel, explosives, machinery, spares, foreign exchange, etc. was mentioned as one of the most important reasons for the non-completion of irrigation projects in time by the Minister of State in the Ministry of Irrigation on August 24, 1981 in the Lok Sabha.<sup>28</sup> According to the Working Group on Irrigation, there used to be invariably considerable delays in the completion of the projects due to difficulties in procurement of construction materials, etc., at one time or the other in course of construction. No doubt, difficulties did arise on certain occasions on account of shortage of transport vehicles (railway wagons, etc.) for carriage of materials like cement, coal, etc. to project sites. There was, according to the Group, considerable improvement in this regard and there were no hold-ups/delays due to any scarcity of materials and equipment.<sup>29</sup> The delay in the procurement of construction material is not a new one. According to the Irrigation Commission (1972) the progress of several major and multi-purpose projects, during early fifties, was seriously hampered on account of short supply of steel. The whole question of construction equipment and spares was examined by the 'Committee of Ministers appointed by the Union Ministry of Irrigation and Power and the Commission was of the opinion that these recommendations should be fully implemented. The main recommendations were : (i) modification to import policy for procurement of critical spares and enhancement in value of foreign exchange for import of emergency spares; (ii) relaxation of some provisions of import policy to quicken the processing of application for licenses; (iii) setting up a central mechanical unit organization in the States to guide proper utilisation and



rehabilitation of surplus machines and spares; (iv) setting up a cell in CW & PC to co-ordinate optimum utilization; (v) identifying items for indigenous manufacture to substitute import; and (vi) quality control and pricing of indigenous parts.<sup>30</sup>

The 4th Conference of State Ministers of Irrigation held in 1979 recommended that a High Level Standing Committee comprising of representatives of the Ministers of Agriculture and Irrigation, Industry, Railway, Steel Authority, State Trading Corporation, etc. be formed to review the position and remove the availability and supply of scare construction material like cement, steel, coal and explosives for use of Irrigation Projects. The State Governments were also urged through the resolution to set up necessary Material Management Cells for the timely assessment and identifying these materials to watch their allocation, movement and receipt. As follow up of the resolution adopted by the Conference, a High Level Standing Committee was constituted by the Union Government.<sup>31</sup> The first meeting of the Committee was held in July 1979 in which State Government representatives also participated. The Committee impressed on the representatives of the States to set up Material Management Cells for Planning and Procurement of scare materials with continuous linkages with the projects so that all the related statistics may be available for proper planning and procurement. The above resolution, however, has not been implemented by the States till the Fifth Conference in November 1980. This is in spite of the fact that the Central Water Commission had issued a letter to the State Irrigation Secretaries in this regard in July 1980.<sup>32</sup>

Detailed advance planning with regard to procurement of such scarce materials is called for in future, for avoiding delays on this account. In view of the targets that have been set for the country,<sup>33</sup> it is necessary to plan for adequate supplies of cement, steel, explosives, coal and high speed diesel well in advance so that these supplies do not constitute a hindrance in achieving the targets. If adequate supplies of key construction materials are not available in time to the irrigation projects, it would be difficult to achieve the targets which in themselves constitute an escalation of 50 per cent over the past performance.<sup>34</sup> In the Sixth Conference of the State Ministers of Irrigation in September 1981, the Union Irrigation Minister said : "The Government of India have taken various steps to ensure sufficient supplies of scarce construction materials like cement, steel, coal, etc. which has affected the progress of some of the projects in the country. It has been proposed to the Ministry of Industry that 7.5 million tonnes of cement may be earmarked for the irrigation and power projects in 1981. Separate allocation of cement is now being made for irrigation and power projects by Central Water Commission and Central Electricity Authority in consultation with the project authorities."<sup>35</sup>

Non-availability of adequate financial allocations to individual projects has held up progress of irrigation projects leading to prolonging the construction period and delay in the realisation of benefits. The analysis of the 6 projects by the Expert Committee showed that as against the original completion period of 5 to 10 years the revised targets covered 12 to 20 years.

Although the Committee felt, generally completion periods indicated in the original reports were too optimistic and not related to what was physically achievable, the fact remained that non-availability of adequate funds did affect the progress of the major irrigation projects in an adverse fashion. To relieve the situation, the Committee recommended that the projects should be planned in phases and taken up phase by phase. Further, the financial phasing should be made to match the physical phasing. Once a project has been approved by the Planning Commission, funds should be made available fully for its execution. Whether adequate funds would be available has to be thought out in advance and planning would have to be done before sanctioning a project.<sup>36</sup> An important reason for the inadequacy of funds is the widely noticed habits of States to demand new projects in the plan for various reasons<sup>37</sup> even by restricting allocations on the ongoing projects. This tends to lead to proliferation of projects and scattering of resources too thinly on a large number of projects and this should be discouraged.<sup>38</sup> The Working Group recommended that whatever major projects are taken up should be taken up with a time bound target for their completion. To ensure this the Group recommended that the system of earmarking of outlay should be extended to all projects where expenditure of about 10 per cent of the estimated cost of the project has already been incurred.<sup>39</sup>

One point which has been stressed time and again in the conferences of the State Ministers of Irrigation is the additional Plan assistance from the Union Government for irrigation projects. The Fifth Conference emphasized that it was necessary to ensure the implementational capability built up with the States over the years was not allowed to be slowed down due to financial

constrain, more specifically in the States which were relatively backward in the irrigation. In addition, the States may have to take up joint projects, benefiting more than one State. Left to themselves, such Inter-State projects were expected to be given lower priority by the States. Therefore, in the interest of quick irrigation development from such projects, it was necessary that Centre offered financial assistance to the States in the form of an incentive so that State took interest in such projects.<sup>40</sup> The recommendation of the National Commission on Agriculture in this regard is : "In order to carry out construction of large projects at the optimum pace, Centre should provide additional outlays for them after ascertaining the outlay which can be reasonably met from the State Plan."<sup>41</sup>

Irrigation being a State subject, the projects are being planned, executed and operated by the concerned State Governments. Never the less, Centre does provide financial assistance to the States based on certain norms. In addition other forms of assistance with regard to planning and execution of programmes is provided by the Centre to the States and is as follows : (i) scrutiny and technical examination of the irrigation projects; (ii) consultancy for preparation of project and detailed designs; (iii) assistance for quality control; (iv) procurement of scarce materials; (v) foreign exchange requirements; (vi) Survey of India's assistance regarding topographical surveys; (vii) Geological Survey of India's assistance for engineering geology; (viii) assistance from the Central Ground Water Board for exploration of ground water; (ix) using good offices of the Centre for settlement of inter-State water disputes; and (x) assistance regarding supply of hydrological data and information.<sup>42</sup>



The foregoing gave an account of the principal causes of cost rise and delay and remedial measures to be adopted to avoid wasteful expenditure and inordinate delay in the completion of major and medium projects. There are some other factors like, land acquisition, plans and estimates for the distribution systems and structures and timely up-dating of estimates which have led to cost escalation and delays. Land acquisition has two aspects, one relates to increase in land rates and the other to difficulties in land acquisition. With regard to increase in land rates, the Expert Committee noted a phenomenal increase in land prices. In Jayakwadi project in Maharashtra over 22 per cent of the total increase in cost of the project was found to be due to this factor alone. In the six selected project estimates examined by the Committee, the increase of land rates over the rates adopted in the estimates ranged from 81 to 330 per cent. It is a common complaint on the part of construction engineers that they are not able to get possession of land for constructing various components of the project. In many cases difficulties are experienced in execution of rehabilitation programme due to problems created on account of scale and modes of compensation.<sup>43</sup> During the investigation stage, the tendency is to concentrate attention on investigations for major structures like dam or barrage and relatively little attention is paid to investigations for canal system. This calls for detailed plans and estimates for distribution system side by side. There has been no serious effort towards up-dating of cost estimates of projects at regular intervals. The Working Group has suggested the creation of Cost Control Cells on major projects to keep continuous track of actual costs and suggest measures for effecting savings through more efficient construction operations.<sup>44</sup>



An important ingredient of an irrigation project is the organization structured to attain the desired objectives. At present, a number of organizational patterns are being tried in the country. The execution of some of the major projects is under the overall direction of Control Boards set up for the purpose. The majority of projects, however, are being executed either by the Public Works Department or by the Irrigation Department. With regard to the organization for the irrigation projects, the Irrigation Commission recommended "that all large inter-state projects and any State project costing Rs.500 million or more should have a Control Board. Even for project costing less than Rs.500 million but which are of a complicated nature, a Control Board would be desirable. To be effective, Control Board should be delegated the maximum powers and should in turn be liberal in delegating powers to the Chief Engineers of projects in the interests of efficiency. In States where several projects are under construction, a single Control Board with standing Committees for each project would suffice. This would help to promote the best use of man-power and equipment. Where a major project receives special financial assistance from the Union Government, the Centre should be adequately represented on the Control Board."<sup>45</sup>

The same views were endorsed by the Expert Committee (1973) and the Working Group on Irrigation (1980). For a major river valley project, according to the Expert Committee, there must be a Chief Engineer or Project Manager posted exclusively for its execution. In case of Ramganga Project the Chief Engineer changed five times during five years. In this respect the Committee made two pointed recommendations : (i) there should not be too frequent changes in the key personnel entrusted with

execution of the projects; (ii) the person in-charge of execution should be granted appropriate authority, both administrative and financial so that he may discharge his responsibilities unhesitatingly.<sup>46</sup>

One of the factors which is responsible for the short fall in achievement of physical targets in various projects has been the lack of detailed construction planning, at the start of the project. Had there been a regular system of monitoring the progress of construction, the delays in number of cases could have been avoided by taking timely action with regard to potential obstacles. It is an observation of the IBRD (World Bank) that most of our irrigation projects take longer time than similar projects in developed countries. The observation further indicates that this is largely due to almost complete absence of modern management techniques in the implementation of projects. The World Bank has now been prescribing the condition on the borrowing agencies to form monitoring cells at various levels for advancing loans.<sup>47</sup> The Fifth Conference of Ministers of Irrigation as well as the Working Group on Irrigation also emphasized the setting up of monitoring units at States as well as project levels in case of Major schemes. To give an incentive to the States to create these organizations, the Centre should finance the expenditure on these organizations on a matching basis. This is being proposed under Central Sector Programme.<sup>48</sup> An important organizational requirement for major irrigation projects is the creation of a Council at the Centre. The National Commission on Agriculture had recommended that, "A National Water Resources Council should be set up to lay down broad technical, economic and financial policies in irrigation

for the country as a whole, keep a watch on the problems of inter-state rivers and ensure that irrigation projects are formulated to conform to the highest national interest."<sup>49</sup> The creation of NWRC was also emphasized in the Sixth State Irrigation Ministers' Conference in September 1981, to ensure speedy resolution of inter-State river water disputes. It was pointed out by Union Irrigaion Minister that 66 major irrigation projects in the country were held up because of the river water disputes.<sup>50</sup> The proposal to set up a National Water Resources Council (NWRC) under the Chairmanship of the Prime Minister was approved by the National Development Council (NDC) in its Meeting on 14-3-1982, with State Chief Ministers and concerned Central Ministers as members. The Council, it was stated, would enact legislation to facilitate speedier settlement of inter-state river water disputes. The NDC agreed that climate should be created in which national water plans are prepared, keeping in view the national perspective as well as state and regional needs.<sup>51</sup>

We have discussed in considerable detail the factors responsible for the cost escalation and delay in completion of major and medium project and the remedial measures which should be adopted to off set the situation in a positive way. However, certain observations which have a bearing on the national policies and programmes concerning irrigation in general, and the major and the medium irrigation in particular, need to be made. Although the Working Group on Major and Medium Programme (1980-85) has discouraged States from taking new major and medium irrigation projects at the cost of on-going ones, but from the perspective of keeping a regional balance and in view of the long term goals,

some new projects may have to be started. The Working Group, therefore, recommended that for this purpose emphasis should be on taking up new medium projects, which are expected to have short gestation periods and a better regional distribution.<sup>52</sup>

Let us examine the 1971-81 data and see how medium projects have done in comparison to the major ones. As earlier pointed out by us, during this period 105 major projects were launched constituting 84.20 per cent of the total estimated cost of Rs.10219.55 crores on major and medium projects (see Table 2). The estimated cost for 422 medium projects constituted 15.80 per cent of the total money estimated. But as far as creation of ultimate potential is concerned, the major ones were expected to create 52.66 per cent of the total potential of 23452.40 thousand hectares and medium were to create 47.33 per cent of the total. Thus, what we notice that there is a vast difference in the estimated cost of major and medium projects for creating about the same amount of ultimate potential, which is about 47 per cent for the medium and about 53 per cent for the major. Thus, rupees one crore is expected to create an ultimate potential of 1.43 thousand hectares in case of major and 0.87 thousand hectares in case of medium. But when we compare the actual expenditure incurred upto March 1980 and the actual potential created upto June 1980, we find an entirely different kinds of result emerging. Here, rupees one crore has created 1.29 thousand hectares of irrigation potential in case of major projects compared to 1.14 thousand hectares in case of medium ones. The logical conclusion we may arrive on the basis of this is that, very unrealistic estimates have been prepared in case of medium irrigation projects and in terms of investments and irrigation potential created medium projects are a slightly worse off proposition compared to major projects.



However, when we compare major and medium irrigation with minor irrigation,<sup>53</sup> (see Table 4) we find, "small is beautiful". During the plan era, upto 1980-81, a sum of Rs.11544.71 crores has been spent and out of it about 76 per cent has been spent on major and medium irrigation and only about 24 per cent of the total has been spent on minor irrigation. But when we examine the development of irrigation potential in two groups, we find an inverse relationship between the outlay and development of irrigation potential. During plan period 49 per cent of irrigation potential was developed through major and medium irrigation, while about 76 per cent of outlay was spent on it. On the other hand, minor irrigation developed 51 per cent of the total irrigation potential, while only about 24 per cent of outlay was spent on it. During the whole plan era, fifth plan period (1974-78) is the only time when major and medium irrigation projects developed more irrigation potential (52.02 per cent compared to minor's 47.98 per cent). There is a point when Vohra complains of an "excessive pre-occupation with gigantic irrigation projects and pre-emption of large financial resources for them." This, according to him, has led to an almost criminal neglect of minor irrigation development, particularly ground water development.<sup>54</sup> Therefore, a deliberate and conscious policy decision needs to be taken to accord high priority to the development of minor irrigation. Big or gigantic need not be all that beautiful, the small may really be beautiful.

Table-1 : Cost Escalation of Major Irrigation Projects

State	Period	No. of Project	Estimate (Rs. crores)		Percentage Rise
			First	Latest	
1. Andhra Pradesh	1951-67	6	198.00	443.00	124.00
	1971-81	6	162.78	769.73	372.86
2. Assam	-	Nil	-	-	-
	1975-80	2	31.15	39.30	26.16
3. Bihar	1956-68	7	142.00	417.00	194.00
	1975-80	9	585.10	728.82	24.56
4. Gujarat	1948-66	5	128.00	281.00	119.00
	1971-80	8	178.38	440.12	146.73
5. Haryana	1951-66	2	11.00	26.00	136.00
	1971-76	2	44.13	124.28	181.62
6. Jammu & Kashmir	-	Nil	-	-	-
	1973	1	29.84	61.61	106.46
7. Karnataka/ Mysore	1947-63	6	106.00	315.00	197.00
	1976-78	2	374.19	498.00	33.08
8. Kerala	1957-66	7	34.00	115.00	238.00
	1975-81	7	248.45	388.31	56.29
9. Madhya Pradesh	1951-67	6	78.00	178.00	128.00
	1971-80	15	490.07	722.31	47.38
10. Maharashtra	1957-68	13	235.00	392.00	67.00
	1975-81	10	416.77	769.55	84.64
11. Manipur	-	Nil	-	-	-
	1980	1	47.25	54.00	14.28
12. Orissa	1947-59	3	67.00	150.00	124.00
	1973-79	8	613.72	643.89	4.91
13. Punjab	1963-69	2	260.00	373.00	43.00
	1975-80	7	703.83	905.58	28.66
14. Rajasthan	1957	1	66.00	119.00	80.00
	1971-72	2	120.48	295.19	145.01
15. Tamil Nadu	1962-64	2	32.00	57.00	78.00
	1976	1	14.55	72.00	394.84
16. Uttar Pradesh	1959-68	2	105.00	193.00	84.00
	1971-81	21	988.65	1906.67	92.86
17. West Bengal	1946-61	2	41.00	66.00	61.00
	1975-80	3	104.99	185.27	76.46
INDIA	1946-69	64	1503.00	3127.00	108.00
	1971-81	105	5154.33	8604.63	66.94

Source : Data for the period 1946-69 has been reproduced from the Report of the Expert Committee (1973, pp.9-10) on Rise in Costs of Irrigation and Multipurpose Projects, while the data for the period 1971-81 was obtained from the Ministry of Irrigation, Government of India, New Delhi.

Table 2 : Major and Medium Irrigation (Plan-wise)

Plan Period	Type of Irrigation Project	Latest Estimate (Rs.in crores)	Expenditure upto March 80 (Rs.in crores)	Ultimate Potential ('000 ha.)	Potential created June 80 ('000 ha.)
Upto March 1974	Major	1944.60 (22.60)	809.91 (33.58)	2173.17 (17.59)	402.70 (12.95)
	Medium	308.97 (19.13)	208.00 (36.44)	1561.31 (14.06)	397.59 (61.00)
March 1974 to April 1978	Major	3982.97 (45.29)	1292.38 (53.59)	6889.50 (55.78)	2631.59 (84.68)
	Medium	718.53 (44.49)	297.43 (52.11)	8760.09 (78.90)	144.75 (22.21)
April 1978 Onwards	Major	2677.09 (31.11)	309.11 (12.83)	3287.90 (96.62)	73.30 (2.36)
	Medium	587.39 (36.38)	65.30 (11.44)	780.43 (7.03)	109.39 (16.78)
1971 to 1981	Major	8604.66 (100.00)	2411.40 (100.00)	12350.57 (100.00)	3107.59 (100.00)
	Medium	1614.89 (100.00)	570.74 (100.00)	11101.83 (100.00)	651.73 (100.00)

Note : Figures in parentheses indicate percentages

Sources : Data obtained from the Ministry of Irrigation, Government of India, New Delhi.



Table 3 : Cost Escalation in Major and Medium Projects (Plan-wise and State-wise)

(Rs. in crores)															
Name of State	Size of Project	No. of Project	Upto March 1974			April 1974 to March 1978				April 1978 Onwards				% of Escalation During 1971 - 1981	Total No. of Projects
			Appro- ved Cost (Rs.)	Cost (Rs) Escala- ted	% of Cost Escala- tion	No. of Project	Appro- ved Cost (Rs.)	Cost (Rs) Escala- ted	% of Cost Escala- tion	No. of Project	Appro- ved Cost (Rs.)	Cost (Rs) Escala- ted	% of Cost Escala- tion		
1. Andhra Pradesh	Major	5	140.76	606.95	431.90	-	-	-	-	1	22.02	N.E.	N.E.	372.86	6
	Medium	-	-	-	-	16	52.58	31.87	60.59	5	29.01	6.32	21.75	48.00	21
2. Assam	Major	-	-	-	-	1	15.83	6.66	42.07	1	15.32	1.49	9.72	26.16	2
	Medium	3	3.81	3.89	102.36	9	16.27	1.98	12.11	7	25.98	1.37	5.27	27.17	19
3. Bihar	Major	-	-	-	-	7	418.45	136.43	32.60	2	166.65	7.29	4.37	24.56	9
	Medium	9	5.82	14.84	254.98	26	97.84	69.57	71.10	9	45.33	1.28	2.82	58.40	44
4. Gujarat	Major	4	74.01	171.37	231.55	2	60.31	61.78	102.43	2	44.06	28.59	64.88	146.73	8
	Medium	19	20.98	26.67	127.07	15	32.80	27.20	82.89	14	68.68	14.65	21.33	71.08	48
5. Haryana	Major	1	4.13	25.86	626.25	1	40.00	54.29	135.72	-	-	-	-	181.62	2
	Medium	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6. Himachal Pradesh	Major	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Medium	-	-	-	-	2	5.52	2.16	39.13	-	-	-	-	39.13	2
7. Jammu and Kashmir	Major	1	29.84	31.77	106.46	-	-	-	-	-	-	-	-	106.46	1
	Medium	3	4.54	3.96	87.00	10	12.80	8.83	69.03	4	16.03	N.E.	N.E.	45.92	17
8. Karnataka	Major	-	-	-	-	1	90.54	7.46	8.24	1	283.65	116.35	41.02	33.08	2
	Medium	-	-	-	-	6	19.53	3.41	17.46	9	31.73	4.73	14.87	11.11	15
9. Kerala	Major	-	-	-	-	6	84.88	127.44	150.14	1	163.57	12.42	8.00	56.29	7
	Medium	-	-	-	-	-	-	-	-	1	7.60	4.40	57.89	57.89	1
10. Madhya Pradesh	Major	4	27.11	48.93	180.48	5	83.32	9.99	17.98	6	379.64	173.32	45.63	47.38	15
	Medium	1	0.47	N.E.	N.E.	48	77.46	35.79	46.19	24	103.18	11.02	10.67	23.50	73
11. Maharashtra	Major	-	-	-	-	9	344.11	352.78	102.51	1	72.66	N.E.	N.E.	84.64	10
	Medium	26	43.69	37.34	85.46	26	40.54	16.56	40.85	17	61.45	5.11	8.31	40.71	69
12. Manipur	Major	-	-	-	-	-	-	-	-	1	47.25	6.75	14.28	14.28	1
	Medium	1	4.62	12.24	264.93	4	12.42	5.06	40.77	1	15.00	N.E.	N.E.	53.98	6
13. Orissa	Major	3	46.85	1.61	3.43	3	316.65	100.04	31.59	2	250.27	-71.48*	-28.56	4.91	8
	Medium	10	22.56	47.14	209.06	13	24.56	29.74	121.14	6	44.19	26.16	59.19	106.82	29
14. Punjab	Major	-	-	-	-	6	551.80	144.78	8.12	1	152.03	156.97	103.25	28.66	7
	Medium	-	-	-	-	2	4.30	3.01	69.93	-	-	-	-	69.93	2
15. Rajasthan	Major	2	120.48	174.71	145.01	-	-	-	-	-	-	-	-	145.01	2
	Medium	2	5.04	0.96	18.84	9	20.11	18.81	93.53	5	22.28	7.17	32.19	76.44	16
16. Tamil Nadu	Major	-	-	-	-	1	14.55	57.45	394.94	-	-	-	-	394.84	1
	Medium	1	0.99	2.77	279.79	6	9.20	0.55	5.86	1	3.66	-0.39*	-	39.47	8
17. Tripura	Major	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Medium	-	-	-	-	-	-	-	-	3	21.16	5.93	28.02	28.02	3
18. Uttar Pradesh	Major	6	88.00	352.22	400.25	7	616.05	237.38	38.53	8	284.60	328.42	115.39	92.86	21
	Medium	18	35.17	8.27	23.51	12	20.41	5.57	27.30	2	4.36	N.E.	N.E.	28.60	32
19. West Bengal	Major	-	-	-	-	1	69.72	80.28	115.14	2	35.27	N.E.	N.E.	76.46	3
	Medium	5	2.53	0.67	26.48	12	7.77	4.32	55.67	-	-	-	-	64.90	17
INDIA (Total)	Major	26	531.18	1413.42	266.09	50	2706.21	1276.76	47.18	29	1916.94	760.15	39.65	66.94	105
	Medium	98	150.22	159.76	105.67	216	454.10	264.43	58.23	108	199.64	87.75	17.56	48.94	422

Note : N.E. = No Escalation

\* = Latest estimated cost was lesser than approved cost

Source : Data obtained from the Ministry of Irrigation, Government of India, New Delhi.



Table-4 : Outlay on Development of Irrigation Potential

Period	Outlay/Expenditure (Rs. crores)			Irrigation Potential (million Hectares)		
	Major and Medium Irrigation	Minor Irriga- tion	Total	Major and Medium Irrigation	Minor Irriga- tion	Total
1	2	3	4	5	6	7
Pre-Plan Benefits	-	-	-	9.7 (42.92)	12.9 (57.08)	22.60 (100.00)
First Plan	380.0 (83.33)	76.0 (16.67)	456.0 (100.00)	2.5 (68.31)	1.16 (31.69)	3.66 (100.00)
Second Plan	380.0 (72.80)	142.0 (27.20)	522.0 (100.00)	2.1 (74.20)	0.73 (25.80)	2.83 (100.00)
Third Plan	581.0 (63.92)	328.0 (36.08)	909.0 (100.00)	2.3 (50.88)	2.22 (49.12)	4.52 (100.00)
Annual Plan (1966-1969)	434.0 (57.11)	326.0 (42.89)	760.0 (100.00)	1.5 (42.98)	1.99 (57.02)	3.49 (100.00)
Fourth Plan (1969-1974)	1237.0 (70.69)	513.0 (29.31)	1750.0 (100.00)	2.6 (36.62)	4.50 (63.38)	7.10 (100.00)
Fifth Plan (1974-1978)	2442.0 (79.47)	631.0 (20.53)	3073.0 (100.00)	4.12 (52.02)	3.80 (47.98)	7.92 (100.00)
Annual Plan (1973-1979)	977.0 (80.58)	237.0 (19.52)	1214.0 (100.00)	1.04 (44.44)	1.30 (55.56)	2.34 (100.00)
Annual Plan (1979-1980)	1079.0 (80.58)	260.0 (19.42)	1339.0 (100.00)	0.74 (34.58)	1.40 (65.42)	2.14 (100.00)
Annual Plan (1980-1981)	1239.85 (81.48)	281.86 (18.52)	1521.71 (100.00)	0.97 (39.27)	1.50 (60.73)	2.47 (100.00)
TOTAL	8749.85 (75.80)	2794.86 (24.20)	11544.71 (100.00)	17.87* (49.00)	18.60* (51.00)	36.47* (100.00)

Source : Sixth Five Year Plan 1980-85 p.148 and Annual Plan 1980-81 (p.41, Planning Commission, Government of India.

Notes : Figures in parentheses indicate percentages.

\* Excludes pre-Plan irrigation potential.

### NOTES AND REFERENCES

1. Projects costing above Rs.5 crores were used to be classified as major projects, while those costing above Rs.25 lakhs (Rs.30 lakhs in hilly areas) and upto Rs.5 crores were termed as medium projects. However, the Draft Five Year Plan (1978-83) mentioned a new classification which is now adopted. According to it, the medium schemes are those which have a cultivable command area (CCA) above 2000 hectares but upto 10,000 hectares and schemes having a CCA over 10,000 hectares are now termed as major ones.
2. See Free Press Journal (Bombay) and the Pioneer (Lucknow) dated January 25, 1982.
3. Project Scheduling and Monitoring; Bhagirath, Vol.XXVIII, April, 1981, No.2, pp.47-48.
4. Report of the Working Group On Irrigation : Major and Medium Irrigation Programme, 1980-85, November 1980, New Delhi, p.4.
5. Sixth Five Year Plan, 1980-85, Government of India, Planning Commission, New Delhi, p.148.
6. Bhagirath : The Irrigation and Power Quarterly, October 1981, p.183. According to a statement of the Union Irrigation Minister, Kedar Pandey, 68 major irrigation projects were in advance stage of construction and are likely to be completed by the end of June, 1985 (See The Pioneer, a Lucknow daily, February 22, 1982, p.9).
7. Report of the Expert Committee on Rise in Costs of Irrigation and Multipurpose Projects; Ministry of Irrigation and Power, Government of India, New Delhi, April 1973.
8. See for instance, two papers in the Journal of the Institution of Engineers (India), Civil Engineering Division, Vol.61, part C14, 1981 pp 205-208 and Vol.57, part C13, November 1976, pp.1-5.
9. Report of the Working Group on Irrigation, op.cit p.22. The projects along with the date of the start are as follows : (1) Nagarjunasagar (A.P.), 1955 (2) Gandak (Bihar), 1961 (3) Kosi (Bihar), 1955 (4) Malprabha (Karnataka), 1961 (5) Kallada (Kerala), 1961 (6) Tawa (M.P.), 1956 (7) Rajasthan Canal (Rajasthan), 1958 and (8) Kangsabati (West Bengal), 1956.
10. Statement showing State-wise, 25 on-going Major Projects for more than 15 years. Andhra Pradesh; (1) Nagarjunasagar Right Bank and Left Bank Canals; (2) Pochampad (Sri Ramsagar) stage I. Bihar; (3) Gandak; (4) Kosi Barrage and Eastern Canal; (5) Rajpur Branch Canal; (6) Western Kosi Canal. Haryana; (7) Beas Unit I and its execution; (8) Beas Unit II and its

extension. Karnataka; (9) Bhadra; (10) Malaprabha; (11) Tung-abhadra High Level Canal Stage II. Kerala; (12) Periyar Valley. Madhya Pradesh; (13) Tawa. Maharashtra; (14) Bhima; (15) Jayakwadi Stage I; (16) Khadakwasla; (17) Mula; (18) Warna. Orissa; (19) Mahanadi Delta. Punjab; (20) Chambal Stage I; (21) Gurgaon Canal. Uttar Pradesh; (22) East Baigul Reservoir; (23) Gandak. West Bengal; (24) D.V.C. Irrigation; (25) Kangsabati (Reported in Bhagirath, Vol.XXIX, January 1982, p.38).

11. A.C. Chaturvedi (Fellow); Efficiency in Major Irrigation, Journal of the Institution of Engineers (India), Civil Engineering Division, Vol.57, part C13, November 1976, p.1.

12. The six projects were, (i) Jayakwadi Project Stage I (Maharashtra); (ii) Ramganga River Project (U.P.) (iii) Ukai Dam Project (Gujarat) (iv) Beas Project : Unit-I, Beas-Sutlej link (Himachal Pradesh). (v) Kallada Project (Kerala) (vi) Kangsabati Project (West Bengal).

13. Report of the Expert Committee (1973), op.cit, pp.85-96.

14. See, Agenda and Notes; Fifth Conference of State Ministers of Irrigation, Bangalore, November 10-12, 1980, Government of India, Ministry of Irrigation, pp.30-32.

15. Report of the Working Group on Irrigation, op.cit, p.23.

16. Report of the Expert Committee, op.cit. pp.99-105.

17. Report of the Working Group on Irrigation, op.cit,p.23.

18. Proceedings : First Seminar on Evolving the Strategy For Irrigation Development, Central Board of Irrigation and Power, New Delhi, December, 1977, p.5.

19. Ibid. p.6.

20. Ibid. p.124.

21. Report of the Expert Committee, op.cit. pp.109-113 and pp.166-167.

22. Ibid.pp.117-118.

23. Some Aspects of Irrigation Administration : A Case Study of Kosi Project, by Niranjana Pant, Naya Prokash : Calcutta, 1981, p.10.

24. Report of the Expert Committee, 1973, op.cit. pp.99-105.

25. Report of the Working Group on Irrigation, op.cit.p.24.

26. Report of the Expert Committee, op.cit.pp.117-127.



27. O.P.Datta and S.L.Aggarwal, Checklist of Activities Prior to Commissioning of a Multipurpose River Valley Project; Journal of Institution of Engineers, Civil Engineering Division Vol.61, part C14, 1981.
28. Reported in Bhagirath, Vol.XXVII, October, 1981, p.181.
29. Report of the Working Group on Irrigation, op.cit.p.24.
30. Report of the Irrigation Commission, 1972, Vol.I, Ministry of Irrigation and Power, New Delhi, 1972, p.298.
31. See, the Ministry of Irrigation O.M.No. 9.3.79-MFE, dated April 17, 1979.
32. See, Agenda and Notes, Fifth Conference of State Ministers of Irrigation, op.cit. pp.49-50.
33. A strategy has been finalised at the highest level to increase the irrigation potential of the country by three million hectares every year in pursuance of the revised 20 point programme announced by Prime Minister, Indira Gandhi which gives highest priority to increasing the irrigation facilities. The increase envisaged is three times the rate at which additional irrigation facilities were created in the last 30 years. (The Pioneer, a Lucknow daily, January 21, 1982, p.7). As a result, The Union Irrigation Ministry has sought from the Planning Commission an additional Rs.150 crores this year to meet the new target of augmenting the increased irrigation potential in the country. The additional outlay is reported to be made available by way of advance plan assistance. The proposed rate of increase of 3 million hectares per year would make this programme world's biggest effort in bringing additional land under irrigation (The Pioneer, a Lucknow daily, February 1, 1982).
34. This aspect has been examined in detail in the Report of the Working Group on Irrigation, op.cit., pp.30-32 and the Agenda and Notes for the Fifth Conference of State Ministers of Irrigation, op.cit. pp. 49-100.
35. Quoted from Bhagirath, the Irrigation and Power Quarterly, Vol.XXVIII, No.4, October 1981, p.172.
36. Report of the Expert Committee, op.cit. pp.137-140 and p.172.
37. One of the reasons is the pressure from the powerful politicians to please the public of their Constituencies. It was pointed out to the author by an important official of the Planning Commission that important politicians influenced the decision regarding some irrigation projects, although from the technical view point these projects were not sound. To illustrate his point he cited three major irrigation projects. The first



one is Jamrani Dam Project in U.P. approved in May 1975 at an estimated cost of Rs.61.25 crores. It was never a viable project but as two very important political figures were interested they got it cleared. The second is Durgavati Project in Bihar which has a faulty foundation and this project was cleared in May 1975 with an original estimate of Rs.25.30 crores (latest estimated cost being Rs.50 crores). In this case a very important then Cabinet Minister was interested. The third project cited is Somasila Stage I in A.P. sanctioned in September 1973, with an approved cost of Rs.33.52 crores (latest being Rs.59.86 crores).

38. B.B. Vohra : A Policy For Land and Waters; Sardar Patel Memorial Lectures 1980, Government of India, Department of Environment, p.17.

39. Report of the Working Group on Irrigation, op.cit. p.5 and p.23.

40. Agenda and Notes for the Fifth Conference of State Ministers of Irrigation, op.cit. pp.103-105.

41. The Report of the National Commission on Agriculture, 1976, part V, Resource Development, Government of India, Ministry of Agriculture and Irrigation, New Delhi, 1976, p.84.

42. Proceedings : First Seminar on Evolving the Strategy for Irrigation Development, op.cit. p.9.

43. The Report of the Expert Committee, op.cit, pp.131-134.

44. Report of the Working Group on Irrigation, op.cit.pp.24-25.

45. Report of the Irrigation Commission, Volume I, op.cit.p.296.

46. The Report of the Expert Committee, op.cit, pp.173-174.

47. Project Scheduling and Monitoring, Bhagirath, the Irrigation and Power Quarterly, Vol.XXVIII, April 1981, No.2. p.47.

48. Agenda and Notes for the Fifth Conference of State Ministers of Irrigation, op.cit. p.172 and Report of the Working Group on Irrigation, op.cit. p.24.

49. Report of the National Commission on Agriculture, Part V, Resource Development, 1976, op.cit., p.84.

50. See, Bhagirath, the Irrigation and Power Quarterly, Vol.XXVIII, No.4, October 1981, pp.173-174.

51. See, the Pioneer, a Lucknow daily, March 15, 1982.
52. Report of the Working Group on Irrigation, op.cit., pp.4-5.
53. "Minor Irrigation includes all ground water development and surface water development through irrigation projects (both flow and lift) having CCA upto 2000 ha. Drainage and embankment projects costing less than Rs.2 lakhs each are also included. In some areas, micro storage works to improve moisture regime in the vicinity and percolation tanks to replenish ground water are also constructed under the programme" (Report of the Working Group on Minor Irrigation, New Delhi, July 1980, p.6).
54. B.B. Vohra : Land and Water Management Problems in India; Training Division, Department of Personnel and Administrative Reforms, Cabinet Secretariat, New Delhi, March 1975, p.3.

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